doi:10.1093/brain/awu402 BRAIN 2015: 138; 1 | e369

BRAIN
A JOURNAL OF NEUROLOGY

LETTER TO THE EDITOR

Reply: Aleksander Luria and diaschisis

Emmanuel Carrera

University of Geneva, Clinical Neurosciences, Gabrielle-Perret-Gentil 4 Geneva 1205, Switzerland

Correspondence to: Emmanuel Carrera,
University of Geneva, Clinical Neurosciences,
Gabrielle-Perret-Gentil 4 Geneva 1205,
Switzerland
E-mail: emmanuel.carrera@hcuge.ch

Sir,

We appreciate Dr van Cranenburgh's interest in our recent publication. We acknowledge that, to remain concise, we had to make difficult choices on which historical aspects to include. As a consequence, the results of some historical studies, comprising those of Aleksander Luria, were not described. Rather than performing a historical review, the goal of our manuscript was to emphasize how one century of research on diaschisis can help understand brain function based on newly described models of brain organization. We thank Dr van Cranenburgh for elegantly emphasizing the contribution of Luria to the understanding and development of the classic concept of diaschisis.

It should be noted that one aspect of Luria's work is indeed very relevant for the understanding of the effects of a lesion on recently modelled functional networks. In the 1970s, Luria proposed that any mental process can be represented using three functional units organized hierarchically. These primary, secondary and tertiary cortex zones are responsible for an increasingly complex synthesis of incoming information. In parallel, the specificity for the given function diminishes in higher cortical areas (Luria, 1976). Recently, the concept of hierarchical organization at different anatomic levels has been used to evaluate how behaviour can be dependent on organization in functional networks (Park and Friston, 2013; Sporns, 2013). Modules or communities that compose complex functional networks can be considered at different anatomic scales, from neurons to macroscopic brain areas. Actually, each node of a module is composed from smaller modules at a lower hierarchical level in a multi-scale or 'russian doll' fashion (Meunier *et al.*, 2010).

Animal and human studies will be welcome to understand the functional importance of the multi-scale hierarchical organization of functional networks. The study of brain lesions may be an adequate approach to decipher the clinical importance of brain structures at different levels; for instance, by investigating and comparing the role of the different components of the motor network after stroke, from M1 macro-columns to macroscopic cortical nodes of the motor network. In that way, the study of brain modularity may shed new light on one of Luria's main areas of research.

References

Luria AR. The working brain: an introduction to neuropsychology. New-York: Basic Books; 1976.

Meunier D, Lambiotte R, Bullmore ET. Modular and hierarchically modular organization of brain networks. Front Neurosci 2010; 4: 200.

Park HJ, Friston K. Structural and functional brain networks: from connections to cognition. Science 2013; 342: 1238411.

Sporns O. Network attributes for segregation and integration in the human brain. Curr Opin Neurobiol 2013; 23: 162–71.

Advance Access publication January 23, 2015